Limits on Primordial Gas in the AU Microscopii Disk from Far-UV Spectroscopy

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AU Mic (GJ 803) recently became the first circumstellar disk imaged around an M-type star (*Kalas, Liu, and Matthews*, 2004). AU Mic is a member of the β Pictoris moving group, indicating it is $\sim$ 12 Myr old (*Zuckerman et al.*, 2001). This disk is extraordinarily well-suited for comparison to the β Pic debris disk and provides a unique opportunity to examine the dependence of disk evolution on spectral type. The important difference is that, unlike the case of the A-star β Pic, the timescale for radiation pressure to eject sub-micron dust from the outer regions of the AU Mic disk is much longer than the age of the star. The bulk of the circumstellar material might actually be primordial gas and dust (*Kalas, Liu, and Matthews*, 2004). The low inclination of the AU Mic disk ($\sim 5°$; *Kalas, Liu, and Matthews*, 2004) permits investigation of the disk gas with line-of-sight absorption spectroscopy, as has been done in the case of β Pic (inclination = 3°; *Heap et al.*, 2000). In particular, far-UV absorption spectroscopy of molecular hydrogen is sensitive to small amounts of cold gas, since the far-UV electronic transitions of molecular hydrogen are very strong (unlike the far-IR pure rotational transitions). We present an upper limit on molecular hydrogen gas in the AU Mic disk using the Far Ultraviolet Spectroscopic Explorer satellite. This limit is much lower than that obtained from non-detection of mm-wavelength CO emission, and does not require extrapolation from an assumed CO/H_2 ratio (*Liu et al.*, 2004). We discuss the implications of this limit for the depletion of primordial gas in the AU Mic disk and compare it to the limit for β Pic.

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[c] Heap, S.R., Lindler, D.J., Lanz, T.M., Cornett, R.H., Hubeny, I., Maran, S.P., and Woodgate, B., Space Telescope Imaging Spectrograph Coronagraphic Observations of β Pictoris, *ApJ*, **539**, 435–444, 2000.

[d] Liu, M.C., Matthews, B.C., Williams, J.P., and Kalas, P.G., A Submillimeter Search of Nearby Young Stars for Cold Dust: Discovery of Debris Disks around Two Low-Mass Stars, *ApJ*, **608**, 526–532, 2004.